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NAVY FAMILY HOUSING ACQUISITION PROCESS AND USE OF FACTORY-BUILT HOUSING

BY

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This report is dedicated to my parents who taught me to set goals, to my husband who encourages and allows me to achieve them, and to my daughter who makes them all seem worthwhile.

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CHAPTER 1
INTRODUCTION

1.1 Purpose

The purpose of this report is to give a general description of the acquisition process of Navy Family Housing and to examine the use of factory-built housing in meeting the needs of the Navy. The acquisition of Navy Family Housing (also referred to as Navy Housing or Housing) can be broken down into several phases for programming and acquisition. These broad phases include the preliminary or advance planning phase, the programming phase, the legislative phase, and the execution phase. The current housing situation for the military, the White House administration, the Congressional attitude, and the economic conditions of the nation all influence the policies and decisions made concerning Navy Housing. Planning and programming over several years is thus made more difficult because of changes in the people making the decisions and the fluctuations in attitudes and situations involving particular projects. In resolving any question in regard to Housing, all alternatives must be viewed objectively. With this in mind, factory-built housing is currently being studied as an alternative, but is being given an opportunity to compete in bidding against site-built homes, and is even required by legislation to be used on military projects overseas.

1.2 History and Objectives of Housing

Over the years, military housing has evolved into a form of entitlement. In the 1800's, the need to provide quarters for military

families was recognized; hence, a quarters allowance was established based upon a percentage of total pay. Following the end of World War II, the increase in the number of military families brought about an increased demand for military housing far in excess of supply. In an attempt to resolve this problem, Congress funded several housing programs through the 1950's and 1960's. The current inventory of Navy Housing is now over 76,000 units worldwide.

The objective of the Navy Family Housing program is to provide adequate, economical housing to eligible military personnel and their families by first utilizing community resources and then providing government quarters as required. Therefore, the purpose of the program is not to provide government quarters to all Navy families. However, housing is needed as a morale and retention factor, as a service at remote locations, and as a support function for certain mission-oriented activities.

1.3 Terminology

A glossary has been included at the end of this report to identify frequently used abbreviations.

1.3.1 Eligible Members

As previously mentioned, the purpose of the Navy Housing program is not to provide quarters to all Navy families; therefore, the term "eligible" is used to distinguish those who are allowed housing and to set boundaries for housing planning and programming. Military personnel in pay grade E-4, with more than two years of service, and senior who are entitled to basic allowance for quarters (BAQ) with accompanying dependents or spouse are eligible for assignment to government quarters. Department of Defense (DOD) Civilian employees in grade GS-5 (or Wage Board equivalents)

and senior are also eligible according to the guidelines set forth in OPNAVINST 11101.13, Assignment, Utilization, and Occupancy Termination of Navy Managed Family Housing.

1.3.2 Adequate Housing

Another term important in distinguishing quarters is the use of the word "adequate" for both government and privately-owned community housing. Adequate Navy Housing are "dwelling units which are safe, decent, sanitary, and located in a healthy environment."[1] All Navy-owned or managed quarters are considered adequate. Moreover, adequate community housing are "dwelling units which are safe, decent, sanitary, located in a healthy environment, priced within the maximum allowable housing cost (MAHC) of the applicant including utilities, contain the number of bedrooms for which the applicant is entitled, within the prescribed community distance, and available without discrimination."[2] The MAHC is a dollar amount, administratively determined for each pay grade, which represents the maximum amount an individual can be expected to pay for adequate community housing.

1.4 Operational and Budget Resources

The scope of Navy Housing is extensive. Under consideration for matching resources, there are 258,000 Navy families with over 76,000 Navy family housing units. This means that only about 30% of the families live in Navy Housing. The plant value of this inventory is estimated to be 5.5 billion dollars. For fiscal year (FY) 1985, the annual budget for Housing is expected to be around 568 million dollars. The Housing program is financed through a separate appropriation -- The Family Housing, Navy (FH,N) Account, which was previously the Family Housing Management

Account (FHMA). The account includes budgeting for new design and construction, improvements, energy programs, leasing, operation and maintenance, and debt payments.

1.5 Players

New construction proposals for quarters are carefully planned, developed, and closely reviewed at all echelons. The majority of these echelons are reviewing authorities who are tasked with balancing several resources against a normally limited budget. The Field Activity is the mission-oriented installation for which Navy housing requirements are defined. The Engineering Field Division (EFD) is the program manager who does most of the leg work. The EFD does much of the requirements survey, preliminary and site planning, any engineering investigations or analyses, design review with intermediate approval, and contract administration and inspection. Supervising the entire process for the Navy is the Naval Facilities Engineering Command (NAVFAC). In addition to supervision, NAVFAC maintains the overall on-going process of programming, works for the necessary funding approval of projects, and monitors to some extent the design process. Changes have been made in the structure of reviewing echelons. These echelons include an assessment by the resource sponsor who is the Chief of Naval Personnel (OP-01), hearings by the Navy Comptroller (NAVCOMP) and the Office of Secretary of Defense with final allocations authorized through Congressional hearings.

1.6 Management Goals

Although the purpose of Housing is to provide adequate quarters, Housing's comprehensive goal goes deeper than that. Decisions about

housing are guided by the needs of the military member and his family. Management's goal is to pursue an awareness of these needs and implement initiatives which enhance the quality of life of these families. Quality of life is difficult to measure, but is used as a means of improving morale and retention. It has become the basis for certain policies and procedures of the Navy Family Housing Program.

CHAPTER 2
ACQUISITION PROCESS

2.1 Introduction

Most of the acquisition process is a subset of the government budgetary process. Since the evolution of the federal budget is an absorbing and complicated procedure, a discussion of it is not included. However, an important step in conjunction with the budgetary and acquisition process must be emphasized. This is that the planning of housing is staged several years prior to any actual approval, and that even once approval has been made, changes occur at the various levels of the government. For example, Congressional committees review information and supporting data which was collected as far back as five years but which is updated on an annual basis.

The phases of the acquisition process defined in the introduction to this paper are not truly distinct. In actuality, these phases may overlap due to the preparation and timing of the federal budget. Therefore, the titles given to the phases are for the convenience of describing the acquisition process. A diagram of the acquisition process is included as Appendix A.[3]

2.2 Policy

Financial assistance in obtaining family housing is considered an entitlement; hence, BAQ was developed to provide this assistance. The Navy policy is that the primary source of suitable family housing is the

local community. Thus, the acquisition of government-owned or leased housing will result when the private sector does not fulfill the needs of a specific Field Activity.

2.2.1 Application of Policy

Congress controls, through funding measures, the level and timing of construction of government housing. Funds can only be appropriated for housing when there is adequate proof of a shortage. "The shortage of family housing assets; the limited funds for operations, maintenance, and improvements; and the importance of adequate housing to morale, welfare, and retention of military personnel require that maximum benefit be obtained for dollars expended or invested."[4] Consequently, the decision to construct additional housing is carefully scrutinized.

2.3 Preliminary Phase

2.3.1 Requirements Survey

The family housing requirements survey is the basis for developing and supporting Housing Acquisition programs. This is the proof of a shortage that Congress needs. A detailed procedure for preparation of this survey is provided in NAVFAC INSTRUCTION 11101.91E, Survey of Family and Unaccompanied Personnel Housing Requirements. Although this instruction contains procedures for both family and unaccompanied personnel housing surveys, only family housing will be addressed in this paper. The current year survey is used in planning for the acquisition of housing three years from now. For example, the survey completed September 30, 1983 will be used for preliminary planning for the fiscal year 1987 Navy Family Housing Program.

2.3.1.1 Base Loading System

The base loading system contains a series of computer reports which are used to determine and project current and future strengths. The Navy Military Personnel Command (NMPC) provides current personnel strengths while projected strengths are provided by the Chief of Naval Operations (CNO). This portion of the requirements survey generates five reports: housing activity listings, current and projected personnel summary maintenance reports, consolidated personnel summaries, final current and projected personnel summaries, and current and projected activity type summaries.

The housing activity listing serves to ensure that all Navy and other service activities are included in the scope of the survey for each housing complex. The current personnel summary indicates the actual permanent party personnel by pay grade for each Field Activity. The projected personnel summary is a confidential report which reflects the CNO approved personnel strength by pay grade for each Field Activity at the end of five years. The consolidated reports combine the total current and projected strength by Field Activity. The activity type summaries shows the distribution of military personnel by organizational component types such as ship, squadron, and students.

The base loading system not only provides information for the housing survey, but also provides supporting data for such programs as military construction, Department of Housing and Urban Development, leasing, improvements, and disposals.

2.3.1.2 Family Housing Questionnaire

> The Family Housing Questionnaire is the primary tool for obtaining specific information on the adequacy of occupied community assets and specific requirements by bedroom. At locations having less than 1,000 families, questionnaires are distributed to all military personnel with dependents. At locations having more than 1,000 families, the sample method survey (SAMS) is utilized. Through this method, personnel are randomly selected by pay grade group to complete a questionnaire. These responses are then extrapolated to the total number of military personnel with dependents within the area surveyed.[5]

2.3.1.3 Suitability Criteria for Community Assets

For Community Assets to be considered suitable, they must meet the adequate criteria defined earlier as well as cost, commuting distance, condition, and bedroom requirements criteria. For cost purposes, "community housing is considered suitable when the amount of rent, including all utilities (except telephone), or the mortgage payment, including taxes and insurance, plus maintenance and all utilities (except telephone), is less than MAHC for the service members."[6] Where additional allowances apply such as in foreign countries, this amount is added to MAHC. The unit is suitable if the commuting time to the member's duty station by a privately owned vehicle is one hour or less during rush hours. Each unit must be a complete dwelling unit with private entrance, bath and kitchen, all of which are for use only by the occupants. The kitchen and each bedroom must be arranged so they can be entered without going through another bedroom. "The units must be well constructed and in a good state of repair, with the heating equipment, stove, and refrigerator provided or available on a rental basis.

The unit must be located in a residential area which meets acceptable standards for health and sanitation and which is not subjected to offensive fumes, industrial noises, or other objectionable features."[7] Bedroom entitlements require that no child have to share a room with a parent, not more than two children share a bedroom, no child six years or older share a bedroom with a child of the opposite sex, and a dependent ten years old or older (except spouse) have a separate bedroom.

2.3.1.4 Community and Military Assets

Community assets include rental units (including manufactured homes) which are occupied by military personnel and any owner-occupied units except those occupied by members who were forced to buy housing to prevent family separation. Also, of those assets not occupied by military personnel, a certain percentage (based on the ratio of military households to the total households in the commuting area) of both existing vacant rental units (excluding efficiencies) and any units definitely planned or under construction is counted as community assets. However, for identification purposes, vacant units which are for sale are not counted as assets. Community assets considered must be available on a nondiscriminatory basis, cannot restrict children, and must meet suitability criteria.

Military assets are units that the government owns, leases, or acts as landlord. These units appear on the inventory reports and include those declared inadequate. The report on these assets shows the designation of the unit as to grade and what grade actually occupies the unit.

2.3.1.5 Tabulation of the Survey

"Gross housing requirements are comprised only of personnel who draw BAQ for dependency reasons and are commissioned officers, warrant officers, or enlisted personnel in pay grades E-4 through E-9."[8] The categories of personnel on the survey include permanent party, permanent change of station students, key civilian personnel (who reside on the installation due to the nature of their job or because local housing is not available), and involuntarily separated personnel because housing was not available for their families.

The survey information is listed according to the number of officers, eligible enlisted, and civilians and then totaled. Next these effective requirements are categorized by rank and bedroom entitlement. A deficit is calculated when all suitable housing (military and community) is less than the effective requirements. The tabulation of the survey is prepared on DD Form 1377 and is included as Appendix B.[9]

2.3.2 Preliminary Planning and Environmental Assessment

An advance planning letter from NAVFAC triggers the preliminary planning and environment assessment. This letter informs specific EFD's what evaluations and investigations will be performed and gives additional guidance on current policies. Although both planning and environmental assessment are begun in the preliminary stage, they carry over into the programming phase. The requirements for an environmental assessment are

outlined in OPNAV INSTRUCTION 6240.3E, Environmental Protection Manual. Environmental Assessments are prepared for projects which are fifty acres or more. The Environmental Assessment gives a description of the project including the number of units to be acquired, the area these units are to cover, and how much total land will be involved subsequently giving the density per acre. The purpose of this assessment is to forecast impacts to the environment and to propose reasonable alternatives in order to help public officials make decisions which are based on understanding the environment and take actions that protect it. A Site Engineering Investigation (SEI) commences as soon as a site selection is made. A plan of action for the project is prepared depicting significant preliminary planning milestones and providing coordination to the Site Engineering Investigation.

2.3.3 Community Interactions

The long established policy is to rely on the civilian community to provide sufficient housing for military families. Therefore, as requirements become evident, it is important that community organizations be made aware of these needs. Some ways in which this is being accomplished are through Navy-Community Task Force (especially in metropolitan locations), the Chamber of Commerce, the Navy League, Real Estate Boards, home builder associations, and other community/development organizations. On a day-to-day basis, an aggressive housing referral program passes this information on by finding suitable listings of rentals or sales property. This community interaction process can give the developer the needed substantiation to show that a proposed project has a reduced

risk in marketability, and thus, a lower interest rate should be obtainable on borrowed funds. In siting and purchasing of land for use in off-base government-owned quarters, the community is consulted and made aware of the type of possible projects in order that planning for schools and other community resources can be accomplished in a timely manner. However, specific project recommendations cannot be discussed until the legislative program has been approved by Congress. As it was with planning, community interaction will also be an on-going process throughout the programming phase.

2.4 Programming Phase

> Programming will be considered at locations where the family housing survey demonstrates that the total number of available adequate assets, military and private, is less than 90 percent of housing requirements at Field Activities in the United States and possessions and less than 80 percent at Field Activities in foreign countries. At new or reactivated Field Activities family housing will be programmed coincident with anticipated arrival of large groups of personnel.[10]

2.4.1 Program Composition

Although programming is not considered until assets are below the 80 or 90 percent requirements, the need for housing exists above those minimums.

> The type and amount of housing to be programmed for each Field Activity or housing complex will be governed by the lowest predictable strength levels to be maintained, adequacy of existing community and military assets, impact of new military housing on the local economy, environment, community services, and predictable changes in availability of adequate private housing.[11]

Program composition is also structured in relation to duration and level of need, which, in order of priority, are termed long-range, uncertain duration, short-range, and terminal. Long-range is when the need is for a minimum of five years, with no foreseeable subsequent reduction. The uncertain duration also encompasses the minimum five years, but duration thereafter is unpredictable. Short-range is when the need is for less than five years, and a terminal need, which is not based on time, is the balance remaining when the total of the predictable and present military and community assets meet no less than 80 percent of the requirement.

2.4.2 Market Analysis

Conducting a market analysis is an essential step in determining the current and potential availability of housing in the community. This analysis assists NAVFAC in setting priorities among several projects and in justifying the program. Market analyses may be done in-house by NAVFAC or by contract. Programming priority is given to areas determined by these analyses to be the least vulnerable to local market trends and to possible increases in available adequate private housing. Immediate requirements for housing are given precedence over requirements based on only projected personnel increases. Local trends to be analyzed may include community housing inventory and population, vacancy factors for rental and sales property, community attitudes and local government plans and regulations (for example, plans that provide incentives for or that hinder or restrict housing development), conversions of rental property to condominiums, and plans by large industries to expand or relocate. As a point of interest, in the recent past more market justification has been needed for funding and project approval for Housing in metropolitan areas.

2.4.3 Project Documents

Before project documents can be completed, cost estimates must be prepared. The cost estimate is usually based on an assumed five-foot line unit cost. This five-foot line is an imaginary line around a house, five feet from the outside wall, and is used to clarify what the estimate entails. It includes the cost of all hook-ups, structures, and features within this boundary. This calculation does not include development costs for roads or utility lines since those values are incorporated as support costs. The five-foot line unit costs are multiplied by established area cost factors and by the number of units contained in the estimate. On the overall final cost estimate, these totaled values plus support and land costs are itemized with percentages set for supervision, inspection, and overhead (SIOH), and for contingencies.

The project documents are mainly the forms which are used at Congressional hearings to obtain authorization and funding approval. The Narrative on Family Housing (DD Form 1379) provides a description of the major missions of the installation; the surrounding area; general off-base housing conditions; on-base housing conditions; and justification for additional housing containing a report of discussions of the overall housing need with local interest groups. The Military Construction Program Document (DD Form 1390) lists the proposed projects to be included in the military construction program. This proposal includes not only authorization and funding requests for new projects, but also includes funding requests for prior years' authorization. The Military Construction Project Data (DD Form 1391) supports each project in the military construction program. It also includes requests for authorization on

new proposals and previous years' unfunded authorized projects as well as emergency projects. Samples of each of these documents are shown as Appendices C, D, and E respectively.

2.4.4 Design/Construction Format

When programming for acquisition of less than 50 units, construction is not normally considered, rather an alternative means of acquisition such as leasing is preferred on small projects. The timing of the programming steps depends on whether turnkey or conventional design is selected. Again the size of the project normally determines the method used. Conventional design is used on small jobs whereas turnkey is used on large jobs. When the conventional method is chosen, an architectural-engineering firm begins the design process so that a portion of the design can be completed before project documents are submitted to Congressional committees. In addition, this method requires a longer lead time for initiating action since a contract for architectural and engineering services must be negotiated, plans and specifications must be reviewed and approved at the 30 and 100 percent stages, and bids must be solicited as well as the construction contract awarded. On the other hand, the request for proposal (RFP), under the turnkey method, is not announced until after authorization and funding by Congress. The turnkey method is most commonly used and is preferred due to the delaying of design preparations until funding has been approved.

2.5 Legislative Phase

The first chopping block for projects may well be the hearings by the Office of the Secretary of Defense (OSD). Although this office in

fact is not a part of the legislative branch of the government, the outcome of these hearings carries over to the Congressional hearings. If OSD does not approve a project, then Congressional committees may never know of that request. The documents forwarded for review, discussion, and/or approval are DD Forms 1379, 1390, and 1391. If projects are rejected in either hearing session, then they may be resubmitted the following year for authorization and/or funding.

2.6 Execution Phase

Once a project has been authorized and money allocated, the next step is actually acquiring the necessary units. Foremost regarding decisions on housing acquisition is using the most cost effective method. However, certain policy or legislation may overrule this.

2.6.1 Types of Acquisition

Turnkey or conventional design/construction are used on projects of more than 50 units with a limit usually set at 500 units on any one project. Also, for projects of 50 units or more, OSD determines whether it is in the best interest of the government to purchase existing private housing. Leasing units or lease construction are important methods for obtaining housing especially overseas. Further information on leasing and leasing test-programs will be discussed later in this report. Other types which are used less frequently are transfer of excess housing assets from one military service to another and the construction of mobile home parks.

2.6.2 Award and Construction

The conventional design/construction process complies with the following pattern: a design contract is negotiated, plans and

specifications are reviewed, bids for construction are solicited, and a construction contract is awarded to the lowest bidder. In contrast, when a one-step turnkey method is used, an RFP is published outlining how proposals are scored on a point system. The contract is awarded on a cost per quality point basis with a minimum quality standard set. After the design has been completed and construction begun, the appropriate EFD has project management and inspection responsibility. After construction is completed and accepted, the project is turned over to the Field Activity or housing complex for occupancy.

CHAPTER 3
CURRENT HOUSING SITUATION

3.1 Introduction

The current housing situation is important to note because it sets the stage for changes in policy, the formulation of new ideas, or acceptance of alternative solutions to difficult problems. In addition, the overall housing situation has an affect upon the programming decisions in both the short and the long run. By understanding the current and future housing picture, the internal environment and regulations, and any outside forces, the total Navy Housing program can be better conceptualized.

Although plans for additional housing are made when increases in personnel are forecasted, the acquisition of Housing in general is one step behind. First, the need for housing must be recognized; second, it must be proven that no other alternatives besides new construction or leasing will eliminate the need; third, the programmed acquisition must be approved and funded; and finally, the project must be designed and constructed. Hence, the shortage of affordable housing may have become worse during this acquisition period while other complications such as required repairs on the current inventory of military housing may have aggravated Housing conditions.

3.2 Military Environment and Effective Utilization

A high turnover rate for government quarters is prevalent since military personnel are usually assigned to an area for only two or three

years. Thus, the units are being moved in and out of (sometimes with short notice) more frequently than the normal rental unit. This can, at times, make it difficult to attract community resources for the military. Because this constant state of fluctuation is status quo, it is imperative that the Navy effectively manage its resources by having a minimum time that the unit remains unoccupied. In addition, if it is discovered that the current housing inventory is not being managed properly, then requests for additional units due to a shortage will not be approved. Effective utilization may be hampered by excessive downtime for repairs or for administrative reasons, e.g., not rapidly moving in another occupant. Administrative downtime can be improved by better monitoring, but downtime for repairs can be a significant problem. The Housing organization must compete against mission-oriented activities and projects for the manpower necessary to make repairs. The lack of manpower support due to Housing's priority has resulted in cases where the repair and maintenance functions are contracted out to private firms. In many instances, this measure can improve utilization of government quarters, and so, a possible obstacle in justifying the procurement of housing has been removed.

3.3 Outside Market

The outside market has the most influence on any decisions in regard to the construction of military housing. In metropolitan areas where some Naval bases are located, housing is expensive and vacancy rates are very low. Several reasons exist as to why private enterprise has not improved this situation for the military. If local laws permit, then many entrepreneurs convert rental units into condominiums. Therefore, a

portion of available housing is decreased. Also, condominiums and other sales property may be chosen to be built rather than units which are more accessible to the military such as rentals. It is correct to assume that the private sector will recognize the need for housing; however, the local needs may be fulfilled by means which do not alleviate the problems faced by Navy families.

Furthermore, the community may not respond to housing needs for lower pay grades. The amount that this group is able to pay for housing may be lower than comparable groups outside the military. Reimbursements for housing are approved by Congress, and thus, increases commensurate with increases in the economy may be denied. This limits the number of units in the local community that are affordable for specific groups in the Navy. Unless government low-income housing is available, some families may not find housing, and thereby those families are forced to remain at their previous duty stations while the military member moves to the new area.

3.4 Present State of Repairs

Not only is there a problem with obtaining new housing, but also the housing inventory must be maintained, consistently repaired, and improvements made in order to keep them adequate. This then is another way that the managing of the units is examined again to ensure that new construction is absolutely necessary. If repairs are not performed and units become uninhabitable or inadequate, or if maintenance is neglected, then it is more difficult to justify new construction when older units are not maintained and preserved as well as they should be.

Resources for maintenance and repairs may be insufficient, and consequently management cannot always be blamed for the condition of the units. Currently, there is a 400 million dollar backlog of repairs along with 600 million dollars of improvements in backlog for Navy Housing. Decision makers weigh alternatives and make compromises between funds for repairs and improvements or for new construction.

3.5 Construction Forecast

As mentioned previously, the timing of new construction does not coincide with known shortages in affordable housing for the military. The Navy identifies the need for housing three to five years before construction is approved, and occupants must wait one to two years after approval before construction is completed. Moreover, total governmental agreement is required for acquisition.

The Navy must obtain concurrence from the Department of Housing and Urban Development (HUD) throughout the acquisition process. This concurrence must be secured one year in advance of project submittal; a second check must be made with HUD when the project is before Congress; and the final check must be made before construction to see if the government is overbuilding in an area or if a defaulted HUD project may be transferred.

> The local HUD field office generally has current data on the availability of family housing, enabling the field office to agree with the need for the project without further investigation. There may be instances, however, when HUD concurrence will be withheld pending an analysis of the housing market.[12]

Nevertheless, a delay of this nature is acceptable if affordable and suitable housing is found for the military.

Presently the Navy needs 12,000 units worldwide based on survey data. Due to budget constraints, every year certain projects are not approved or authorized. When this occurs and the need still exists, project approval or funds allocation must be delayed another year. There are 1,100 units per year scheduled in the Five Year Defense Plan. As is obvious, the problem continues to amplify while significant funding measures are not taken to reduce the backlogs in repair or construction.

CHAPTER 4
CURRENT POLICIES AND TRENDS

4.1 Focus on VHA

In order to reduce the effects of high cost areas on miliary families and apply the reimbursements for the cost of housing more uniformly, Variable Housing Allowance (VHA) was created. This allowance is based on the average cost of housing and utilities (excluding telephone) for military personnel assigned in particular locations. The trend for the past several years has been to increase VHA while keeping BAQ constant. Congressional philosophy has been that VHA can more easily show how much additional reimbursement for housing is needed and that this allowance can be better tied to local economies. Also, the attitude exists that VHA solves shortages due to deficiencies in the number of adequate quarters by shifting the MAHC upward. With this increase, more units in the community will be considered affordable. As VHA continues to climb, though, the prevailing belief is that it is near its pinnacle.

Construction projects are being scrutinized more carefully with the resulting trend being reductions in future construction. Recent reductions in proposed projects have amounted to almost a 20 percent decrease from prior years. Congressional attitude has been to focus benefits on VHA and to reduce construction. Reductions in construction result because supposedly when VHA is at sufficient levels, the community can absorb more of the military population. Also with greater VHA, it is hoped that community housing resources will grow as housing projects appear

to be more profitable or less risky. As a result of the increased emphasis on VHA, construction programs for Navy Housing have experienced cuts at the NAVCOMPT, OSD, and Congressional levels.

4.2 Leasing

4.2.1 Criteria for Domestic Leasing

Privately owned houses are leased when there is a lack of adequate quarters. Legal restrictions are imposed on the administration of the leasing program. Under previous domestic programs, leasing has been limited to existing properties or those in the final stages of construction. Besides proof of need provided by the housing survey, one of the five criteria listed must apply to the situation.

1. A temporary, but substantial increase in military personnel must exist.
2. A substantial reduction in permanent military personnel will occur in the near future.
3. Construction of family housing would be uneconomical due to the small number of military personnel involved.
4. Personnel attending academic courses at service schools on permanent change of station (PCS) orders require housing.
5. Family housing has been authorized, but construction is not completed or a family housing authorization request is in a pending military construction authorization bill. This housing authorization must be before Congress and not an OSD-approved project or part of a Navy proposed program to justify leasing.[13]

4.2.2 Criteria for Foreign Leasing

"Foreign leasing involves the leasing of housing for DOD sponsored military and civilian personnel in areas outside of the United States, Puerto Rico, and Guam."[14] This type of leasing can be grouped into two categories: top command positions where government quarters commensurate with position are not available, or situations involving undue hardship. In order to obtain a foreign lease, one of the following must apply:

1. The housing survey shows deficits in the distance or condition criteria for housing only. Also, from the economic analysis, leasing must prove to be the most economical option available.
2. The quarters are for special command positions or for the top ranking Navy members within a country.
3. Local customs require advance rental payments for a period exceeding two months.
4. Local restrictions preclude individual leases to foreign nationals.
5. The Office of Secretary of Defense stipulates that an intelligence or classified mission is involved.
6. A construction project has been authorized but is not complete.[15]

An additonal condition which must be met in order for a lease to be renewed is that a 99 percent utilization rate must be maintained.

4.3 Leasing Trends

Due to the emphasis on VHA, the current domestic leasing programs are being phased out in fiscal year 1985. These leases are being terminated upon PCS of the occupant.

Unlike the domestic program, foreign leasing operates under a lease construction program. Under lease construction, private developers construct family housing based on an agreement with the U.S. Government to lease the housing upon completion. This program has been successful overseas in cases where there is no housing available which meets American standards. The number of leased units in this category is expected to remain constant over the next five years.

4.3 Test Programs

The fiscal year 1984 Military Construction Authorization Act contained approval of two test programs -- Section 801 and 802 of this bill. Both programs became effective on October 1, 1983 and have a sunset clause where no agreements under either program may be made after September 30, 1985. The programs are tri-service (Army, Navy, and Air Force) allowing for a total of 12,000 units under both sections for the services. The Navy has two projects of 300 units each under Section 801 and two projects also of 300 units each under 802.

Section 801 provides leasing authority and is similar to lease construction under the foreign leasing program. The Navy will lease 300 units in each location for 20 years. Agreements for leasing and construction of these units may be made with private developers or State and local housing authorities on private land or land owned by a State or local goverment if it is near a military installation. Each development will be reviewed on a point basis which includes construction criteria and maintenance standards. The development with the best dollar per point basis will be awarded the program. The strategy of this program is that community attitude will

be positive since valuable land will not be taken off the tax base, that the government will not be responsible for construction and maintenance, and that the Navy will resolve shortages in housing.

Section 802 permits agreements for assurance of military occupancy in rental housing which is financed and constructed by private developers or by State or local housing authorities. The same criteria applies to the land used as under Section 801. This program has a 15 year, non-renewable term. These 600 units split equally at two locations must provide priority occupancy for military and in return the military will assure a 97 percent occupancy rate. This program allows ineligible Navy families, Navy unaccompanied personnel, and the general public to rent the units with eligible families having first priority. However, the agreement becomes null and void if the owner of the units fails to maintain a satisfactory level of operation and maintenance. In addition, the units to be constructed are to be economical and modest in design. Congress developed this program on the premise that the private sector can provide needed military housing if only given the incentive to build. Both programs provide the private sector with the opportunity to increase the supply of housing for military personnel in the United States.

Because the overall housing policy is to rely on the local community, actions by both the private and public sector are taken to make this possible. Increased VHA, reduced construction, and leasing programs are attempts to carry out this policy. Recent use of test programs illustrate that alternatives to the lack of affordable housing in the local community or alternatives to the high cost and burden of government-owned quarters are being sought and investigated.

CHAPTER 5
FACTORY-BUILT HOUSING AS AN ALTERNATIVE

5.1 Introduction

The level of production in the housing industry is tied to economic conditions and is even an indicator of future decline or improvement in the economy. When the economy is bad, companies go out of business, jobs become scarce, and competition increases for the limited work available. This type of climate combined with streamlined and advanced techniques held the cost of factory-built housing stable while the remainder of the industry was demanding much higher prices for conventionally built homes. The result has been that the factory-built housing industry now has an important role in the overall housing market. For the Navy, with the long acquisition time and the high costs of housing, the time has come for housing alternatives to become acceptable.

5.2 Definition of Types

5.2.1 Factory-built or Industrialized

The factory-built housing industry (also called industrialized housing) is "a generic term used to describe housing produced either totally or substantially in a factory....It does not, however, cover pre-packages and site-built homes that include only one or two pre-fabricated components such as floor and roof trusses."[16] Mobile homes, modular housing, and panelized structures are considered elements of

this industry. However, certain government entities including Congress use manufactured housing in reference to this industry. In a point paper prepared by Sharon Topping, Project Manager at the Western Division Naval Facilities Engineering Command, San Bruno, California, manufactured housing is used at times as the generic term to describe housing construction which employs mass-production techniques such as assembly lines. This would then make the terms "factory-built" and "manufactured" in the generic sense interchangeable, but the industry makes clear distinction between the two.

For clarification, the Navy adopted the following definition for factory-built housing from the California Administrative Code, Title 25, Chapter 3, subchapter 1:

> Factory-built housing means a residential building, dwelling unit, or an individual dwelling room or combination of rooms thereof, or building components, assembly, or system manufactured in such a manner that all concealed parts or processes or manufacture cannot be inspected before installation at the building site without disassembly, damage or destruction of the part, including units designed for use as part of an institution for resident or patient care, which is either wholly or partially assembled on site in accordance with regulations adopted by the commission... Factory-built housing shall not be deemed to include a mobile home,...[17]

Thus, for Navy usage, "manufactured housing" refers to mobile homes only and "factory-built housing" refers to the types applicable to California law. Terms used to refer to the conventional method of housing construction include site-built, stick-built, or conventionally built homes.

5.2.2 Manufactured

According to the Code of Federal Regulations, a manufactured home

> means a structure, transportable in one or more sections, which in the traveling mode, is eight body feet or more in width or forty body feet or more in length, or, when erected on site, is three hundred twenty or more square feet, and which is built on a permanent chassis and designed to be used as a dwelling with or without a permanent foundation when connected to the required utilities, and includes the plumbing, heating, air-conditioning, and electrical systems contained therein. [18]

In 1974, Public Law 93-383, Title VI, directed the Secretary of Housing and Urban Development to establish federal mobile home construction and safety standards. Since June 15, 1976, all manufactured homes have been built in accordance with the National Manufacturerd Home Construction and Safety Standards contained in Title 24, Chapter XX, Part 3280 of the Code of Federal Regulations. In the fourth amendment of Public Law 93-383, also known as the 1980 Housing Act, Congress changed the term from "mobile" to "manufactured" home. One reason for this change was to recognize that less than two percent of all manufactured homes purchased today are ever moved again.

5.2.3 Modular or Sectional

Modular housing consists of "living units built to meet the same code specifications as site-built homes and designed for placement on a permanent foundation. Modular units are shipped from the factory in two or more three-dimensional sections, also called modules, which are united at the site."[19] Similarly, a sectional home is a single-family modular home only, and refers to sections that are part of a modular home. Modular housing may be single or multi-level and can be joined to create more than one individual housing unit, i.e., apartments or townhouses.

Both manufactured and modular homes are transported to sites usually by trucks which must meet state highway regulations, and where applicable, are controlled by the Interstate Commerce Commission. Modular homes must meet the same codes as conventional houses. Modular homes are assembled with cable built into the frame so a crane can lift the section off a truck. A typical module is 12 feet wide by 24 feet long by 9 feet high. They are usually no wider than 14 feet due to highway restrictions.

5.2.4 Panelized packages

Panelization refers to

> a system of wall panels made in the factory and erected at the site. Packages can include roof and floor trusses and mechanical cores that hold kitchen and bath fixtures. Two kinds of panels are available: open-wall panels -- one side of the panel is finished in the factory, the other side finished at the site -- closed wall panels -- the panels are completed at the factory and include insulation, electrical wiring, interior wallboard and exterior finish.[20]

Panelized houses must also meet the same building codes as site-built homes. The panelized process has been used in more than just the housing industry, and it is the closest method to what builders have been doing for years. Marketing for modular and panelized construction is similar; both are usually limited to a 300 to 500 mile shipping radius from the plant.

5.3 Recent Congressional Action

5.3.1 FY 1983 Legislation

Contained in the Military Construction Authorization Act of 1983, the Joint Explanatory Statement of the Committee of Conference directed the military services to use construction performance standards that

permit competitive bids by all types of housing constuction firms on new housing projects built in the United States during fiscal year 1983 and thereafter. The Navy made this modification to the procurement language, but award was still based on the turnkey method of the greatest quality points per dollar rather than to the lowest bidder. The committee also directed the creation of standards on space, structural durability, energy efficiency, material quality, and life safety which are in accordance with the Federal Manufactured Housing Construction and Safety Standards (FMHCSS).

5.3.2 FY 1984 Legislation

Regardless of the FY 1983 legislation where Congress required that terminology restricting the use of manufactured housing be changed, other factory-built housing types had never been restricted due to RFP language or due to failure to meet construction standards. Furthermore, in the Military Construction Authorization Act of 1984, Congress stipulated that only factory-built housing be used on Overseas Projects if the cost of procurement from U.S. companies is no more than twice as much as it would be if procuring on the local economy overseas. The control of the gold flow and the International Balance of Payments (IBOP) prompted this legislation. In addition, this legislation requires minimal use of labor onsite for erection purposes.

5.4 History of Government Projects

5.4.1 Operation Breakthrough

The most notable government project that encouraged the use of factory-built housing was Operation Breakthrough which was instituted in

May 1969. In the early 1970's, the Department of Housing and Urban Development, under Secretary George Romney, sponsored this experimental program in search of ways to alleviate the shortage of low-cost housing.

> According to HUD, "The name Breakthrough came from the realization that it was necessary to 'break through' the historic constraints which have inhibited the development and use of new materials and new methods of financing and sources of capital; and the creation of new forms of marketing which are necessary to provide the incentives for investment required to encourage industrialized production of housing."[21]

Over 225 firms submitted proposals using industrialized housing for this new program. The Department of Housing and Urban Development stressed the use of current technology and conventional architectural designs to assure marketability of the product. The department selected 22 proposals based on technical merit and the attractiveness of the buildings. Along with this, a company's financial position, operating history, current and potential production capacity, site-planning capability, and the ability to meet community concerns were all evaluated. The selection strived for a balance of different housing types such as single-family detached, apartments and townhouses, different materials, and fabrication techniques. The final outcome was that 22 housing manufacturers produced 2,796 units in nine sites around the country at a total price of about $62.5 million with average unit costs of $22,410. In 1972, University of Michigan Prof. Karl A. Pearson observed that "industrialized housing now being built by Operation Breakthrough winners is attractive in appearance and high in quality but, on the whole, does not show substantial cost reductions as against conventional housing."[22]

To ensure safety and convince homebuyers of protection, the National Bureau of Standards developed and the National Academy of Science

and Engineering received test criteria on the project. Some areas checked by these tests included load-bearing strength of wall and roof sections, acoustic characteristics, and fire resistance. These criteria later became the foundation for manufactured housing standards.

Materials and manufacturing techniques varied for the projects. Seven of the contractors employed concrete as the basic structural material; six others used wood; five more used metal particularly for framing; two designs were based on plastic foam-core panels and modules; and two utilized composite materials. The manufacturing techniques included three-dimensional factory-built modules, onsite assembly panels in combination with kitchen and bathroom cores, and poured concrete systems imported from Europe. This last method called the Tracoba System was used by Module Communities, Inc. In this process, massive molds are fitted with reinforcing steel and then wiring and ducting installed; the concrete poured; the mold vibrated and heated for several hours; the completed panel is removed and cured for several weeks; and finally the panels are trucked to the construction site for assembly.

Results of the program vary, and each project has had to stand on its own merits. For example, a 147-unit apartment complex in New Haven, Massachusetts, known as Oriental Masonic Gardens, had to be demolished in 1980 after only eight years in existence due to the exorbitant cost of necessary repairs. Modular Structures built the project and Hercoform Marketing, Inc., was the general contractor on this project. "After a $200,000 repair job and an architectural investigation, HUD concluded that the $8.51 million cost of constructing new units added to the $427,000 cost of tearing down the old ones was close enough to the

cost of further rehabilitation to make new construction worthwhile."[28] The design and construction of the complex were blamed for the problems. The flat roof design of the wooden boxcar-like units caused problems during winters. Furthermore, boxcars placed on concrete slabs, laid at right angles to each other on top of each other, had structural problems with walls and roof leaks from the time they were first built. HUD decided not to bring any legal action against the architect or the builders.

5.4.2 NAS Fallon

In fiscal year 1979, the Navy was unable to award a new construction project for 70 family housing units at Naval Air Station Fallon, Nevada. Only one bid was received which exceeded the $2,820,000 authorization and appropriation by almost 60 percent. An amended authorization request would have delayed the badly needed project by at least two years, so OSD directed NAVFACENGCOM to develop a bid package for placement of mobile homes at the site. WESTNAVFACENGCOM then prepared a feasibility study for the use of mobile homes. This study determined what specific elements of existing family housing criteria could not be readily met by existing production capabilities or common practice and what elements provided by manufacturers were excessive, especially in regard to energy consumption, for DOD criteria. In addition, a cost estimate for siting 66 mobile homes on permanent foundations as one-story single units of a density of 3.9 units per acre was prepared. With apparently no other means of obtaining the needed housing units, the Navy accepted the mobile home project as a test case.

At the same time, plans and specifications for meso-environmental quadraplex (earth covered, energy efficient, sound reducing structure)

were being developed. The plan was to include one four-unit meso-plex as a part of the 70 unit authorization at Fallon. However, the bid opening for the mesoquadraplex was cancelled when it became obvious that there were insufficient funds for both the mobile homes and the quadraplex. Instead of this, the additive bid item for an additional four units was awarded.

The architectural/engineering firm was directed to prepare plans and specifications to procure the 70 units. The low bidder was Ross Builders, Inc., of Fallon and Kaufman and Broad Homes of Rancho Cordova, California. A sign at the Fallon location notes the project to be a test case for the use of "manufactured housing" for the Navy. The units were completed and occupied in December, 1981. "At that time, the Navy's stated position to OSD and Congress was that before any more mobile homes were built, the Navy wanted five years to evaluate performance at Fallon."[24] Data is currently being collected with the report on the project due in 1985.

5.4.3 Adak Naval Station

The project for 100 family housing units at Naval Station Adak, Alaska had unique circumstances compared to any of the previous government projects.

> The naval station at Adak pays extremely high prices for its facilities. Its isolation (1100 air miles southwest of Anchorage, Alaska), its poor weather, and the difficulty of transporting materials to the island result in construction cost averaging more than three times that of the lower 48 states.[25]

In 1978, the Navy awarded this project to a joint venture who had an innovative modular design. Since most modules are transported by rail or truck, the size is restricted, and several are then needed to make up

one dwelling unit. However, the Seattle based contractors for the project developed a whole-house unit as either a complete two- or four-bedroom unit. This was done in order to eliminate most of the onsite assembling and finish work and thus reduce expensive Aleutian labor and equipment costs. The 75 units (50 four-bedroom and 25 double two-bedroom units) were portable two-story box supported structures reinforced by a concrete perimeter foundation. Two- and five-family dwellings were created when the modules were joined by prefabricated entryways and garages.

During the first construction season, site work including road beds, underground utilities, and concrete-post footings for the modules' foundation were completed. Concurrently, construction of the modules began at the Port of Tacoma, Washington. Through the winter months, factory construction continued (a situation not possible at Adak). It took two days to move the 66-ton units one mile to the Tacoma Harbor and to load them on two 450-foot barges. On the barge were two 200-ton cranes used to lift the units, four specially fitted, double-wide flatbed trucks, and all the panels and materials to finish the entryways and garages plus playground equipment for children. The units arrived in April 1980, and all were placed on footings within five days. For the remainder of the second construction season, workers built or installed roads, driveways, entries, garages, street lights, and playground equipment.

5.5 Current Projects

5.5.1 Fort Irwin

In the fiscal year 1982 Military Construction Act, Congress authorized and appropriated funds for construction of 254 conventionally built homes at the Army National Training Center, Fort Irwin, California. Approval

was also given for 200 additional units of manufactured housing (generic sense) to be built simultaneous with the original 254 units. Congress directed that a report be prepared over a five year period comparing both types of units on the basis of construction, energy, maintenance, and repair.

In preparation of the 200-unit portion of this project, approximately 50 manufacturers were contacted, but only two proposals were submitted. The Army awarded the project to a general contractor who subcontracted with a manufacturer of modules for constuction of the units. By coincidence, this same general contractor had been awarded the contract for the 254 site-built homes. It is not uncommon for a large contractor to bid on all housing projects to be built in a local area during a year's time. This is so he can benefit from reduced costs in using local products and people over a significant period of time.

Since the Army prepared the project as turnkey, the general contractor was responsible for the development of the entire project. Some problems arose in the execution of the contract due to the lack of experience by the general contractor with factory-built housing. He did the site-work preparations and the subcontractor worked with the general contractor's engineer on the design. The 200 units consisted of two-story, fourplexes made from 10 modules. The general contractor, who had constructed several stick-built homes, used old drawings of this type from a project of a similar complex as the basis for the factory-built homes. Apparently, instead of preparing new drawings showing points of connection or accessibility, the old drawings were divided into 10 sections for the construction of the modules. However, when the units arrived on site, piping and structural connections

between the modules did not match. The general contractor then had to perform more field construction than originally anticipated in order to make the proper connections. Field work which had been planned (such as painting, roofing, application of exterior stucco, and construction of balconies and patios) was delayed.

Another problem was detected and corrected earlier. The general contractor was responsible for the transportation of the modules to the field. The units were integral structures and were, therefore, unable to be broken down into smaller sections. During transportation of the first few structures, the general contractor learned that the trailers did not provide sufficient support to the modules so the modular frames buckled. The problem was corrected before all units were affected. Because it was a fixed price contract, the general contractor corrected these problems by using his own money. He has since bid only for site-built homes and has decided not to attempt using factory-built homes in the future.

A controversy over inspection jurisdiction was brought out in this project and has never been completely resolved. In California, factory-built housing is subject to inspection by the Department of Housing and Community Development (in Florida, the Department of Community Affairs) pursuant to the Factory-Built Housing Act of that state. For the Fort Irwin project, the Contractor used different standards than accepted by this department. However, the Army's stand was that since the units were purchased by the federal government for use on federal military property, the state had no jurisdiction. The Navy was also confronted with a similar situation when using factory-built modules for use at the Navy Corpsmen School in San Diego. The contention by the Department of Housing and Community

Development (HCD) continues to be that they do have jurisdiction. Their claim is that since the Army or Navy have no regulations governing the construction of factory-built housing, there is no basis for a federal preemption of their regulations by the Supremacy Clause of the United States Constitution. However, the Army and Navy do have standards for factory-built housing and have opposed the HCD's logic. This issue has never been forced any higher or to the courts because the HCD has eventually retreated on their assertations in these two cases.

5.5.2 Subic Bay and Guantanomo Bay

Housing at Subic Bay, in the Phillipines, and Guantanamo Bay, Cuba are the Navy's first units which will have to be manufactured in accordance with Congressional legislation. Although considered overseas, Guantanamo Bay is wholly supported by the U.S. contractors and materials. The Navy anticipated a waiver of the manufactured housing requirements, but a waiver has not been successful. The interest in the Subic Bay project is auspicious. Thirteen proposals have been received which meet requirements, and currently these proposals are being reviewed on quality.

Since the change in the RFP language which allows manufacturers to bid on projects in the United States, only four proposals have been submitted using manufactured housing, and all of which have been at the bottom of the point total in quality.

5.6 Advantages of Factory-Built Housing

5.6.1 Development Time and Assembly Line Techniques

The short amount of time needed to develop most types of factory-built housing makes it advantageous to any large procurement group such as the Navy. Unless modifications must be made, the plant is already to begin

producing units because the majority of the manpower is trained and ready to build. All the workers need to know is what are the changes to the standard product and whether or not the proper material is in stock. Even on some larger complexes, modular units have very few design requirements. The types of modules -- bathroom, kitchen, bedroom, or living room -- normally are arranged in the configuration desired by the customer.

The automobile industry moved a quantum leap forward when the assembly line was introduced. Factory-built housing makes this same claim. On an assembly line, the personnel and the factory constantly are equipped with tools and material for an efficient operation of mass-producing a fairly standardized product. In a well-managed automated system, production is better planned and advanced technology can be introduced more easily. With planned production, volume material purchases are made and managed more efficiently. Moreover, economies of scale in these areas are identified more directly. In this industry, every opportunity is taken advantage of to provide a competitive product.

5.6.2 Construction and Weather

Factory-built housing has the advantage over site-built in certain construction aspects and the weather factor when an entire development is planned. Crews perform site work while factory personnel build the units. Foundations are poured at the same time a roof is put on or painting is completed in the plant. With a short amount of development time, savings for work of this nature are benefits for fulfilling Navy Housing needs. With stick-built homes, late starts, early shutdowns, waits, and other inefficiencies are common. Although concurrent operations and a

shorter development are important time savings, in certain areas of the country bad weather delays construction significantly. Workers are more productive when in a more comfortable atmosphere of a plant instead of, for example, in the field keeping a fire going just to stay warm, or finishing a unit in the rain. Factory-built housing can save construction time, stay on schedule, and have a positive effect on worker's morale.

5.6.3 Quality Assurance

> In contrast to on-site housing construction, where each task is built on the work of the previous one, mobile homes are assembled from a large number of subassemblies that are fabricated independently and then brought together on a main assembly line. Subassemblies, therefore, are interchangeable and tolerances must be finer than those adequate for on-site construction.[26]

Factory-built production is better managed -- there is usually only 100 feet between the head office and the plant. All managers can view operations on short notice. In addition, inspection is easier and quicker to perform. Because assembly usually occurs under one roof, inspectors do not have to move from building to building to view or approve work. Electrical wiring can be quickly checked to see it is secure before exterior panels are attached to the unit. In order to withstand the impact and disturbance of transporting the units, restraint of important elements, such as electrical and mechanical parts and plumbing, is achieved through attachment of clips and caulking around borders. These measures surpass work performed on conventional homes.

Furthermore, not only is quality superior and inspection performed better, but also quality control programs are monitored more easily due to the shorter physical distance to top management or direct supervision. These managers have more control over their quality because there are no subcontractors to deal with in building this home.

5.6.4 Affordability and Innovation

Factory-built housing is more affordable for the typical home buyer. Bureau of Census data for 1981 showed that approximately 8.5 million people live in manufactured homes. Manufactured homes accounted for 37 percent of all new single-family homes sold in 1982 and 18 percent of the total housing starts. Seventy-eight percent of all new single-family houses sold in 1982 for under $50,000 were manufactured homes, and in the same year, the average cost per square foot for a manufactured home was $22.10 while for a site-built home it was $39.25 (both values exclude land cost). The reason for cost savings over conventional homes touted by the factory-built industry include the standardization afforded by the assembly line techniques; efficient, limited number of designs; reduction in factory labor costs because of the ease of using unskilled as well as skilled labor; continuous production stream; a stable and volume pricing structure from suppliers; delivery of materials at one site so field personnel do not have to inventory or check damage; and reduction of vandalism, theft, breakage, and waste. The affordability question is one of continuous disagreement among builders, users, and industry personnel. A round table discussion with heads of these organizations convened and "a consensus ...emerged. Manufactured housing isn't a cure-all. It doesn't deliver enormous cost savings..."[27] At this meeting Bud Owings, Chairman of United Development, Chicago stated, "We got into modular as a way of attacking the affordability issue, but it really hasn't worked out that well for us. We never found any particular cost savings. However, with modular we can deliver a better quality product at the same price."[28] All agreed that cost advantages of factory-built homes are realized the

further the site is from densely populated areas. The affordability contention is resolved on a case by case basis depending upon the circumstances of a project. Nevertheless, the industry uses this as a selling point for their product.

In this industry where competition in certain areas is great, innovations attract the customer. In addition, the manufacturers are willing to take more risks in new designs and techniques than the conventional home builders. Manufacturers design units with cathedral ceilings and bay and greenhouse windows. One of the latest innovations is a prefab building which unfolds at the site. In this prefabricated system, 90 percent of the structure is completed at the factory. The walls, floors, roofs, electrical wiring, and plumbing are assembled there, folded flat into modules, stacked and shipped by truck. A crew of three can then erect a 1,500-sq.-ft. structure in one day. In view of the fact that factory-built housing has been a surviving and prospering market, the product must have offered advantages which site-built homes cannot claim.

5.7 Current Problems and Possible Drawbacks

5.7.1 Industry Image Problem

Manufactured homes (formerly called mobile homes) have had an image problem. With modules and panelized packages, appearance is similar to site-built, so unless told, occupants and visitors may never recognize any difference. However, the manufactured home has had more problems overcoming prejudices. Attempts to change impressions about this industry were most successful when the terminology was changed from mobile to

manufactured. "Even with the vast improvement in every aspect of manufactured homes over the past decade, many people still harbor a negative image of the factory-built houses as some sort of housing aberration that has no place on Main Street, U.S.A."[29]

The impact of this problem is significant for the Navy. When occupants of Navy Housing which are manufactured are aware of it, morale is affected. Occupants may feel as though they have been promised a home of a certain caliber and instead must settle for "second best." This philosophy permeates all the way to some of the higher level decision makers in government including some in the military. The Manufactured Housing Institute conducted a survey to show government officials attitudes. This survey found

> that the majority of the officials characterized housing as a 'top priority' public issue. Many said that they were worried about providing affordable housing for their citizens. Ironically, though, the affordable manufactured home usually remained at, or near the bottom of the list of their solutions to housing problems. Again the negative image posed a mental roadblock to the housing policy-maker's consideration of manufactured housing as a viable option.[30]

For Navy Housing projects to be successful, the prejudices and image problem for this type of housing must be overcome. Factory-built housing has been given by legislation, an opportunity to "prove" itself as an alternative. Personnel involved with housing must work to ensure this opportunity is afforded without prejudices and that any failures of particular manufacturers are not conveyed to the industry as a whole until definitely proven.

5.7.2 Market Competition

Due to the legislative requirement to use factory-built housing on overseas projects, the government has set the stage for possible abuses

in the market. Under the free enterprise system, unless a product has some competition, the consumer (in this case the government) can be taken advantage of. Without competition, quality and cost benefits are limited. Furthermore, the FY 1984 legislation may have allowed for a product that is no longer cost effective. The cost to produce the units have not changed when building them for overseas use. However, during testimony before a Congressional committee, the Manufactured Housing Institute admitted that to ship these three-dimensional units overseas may cost between 50 to 80 percent of the unit's cost. The tradeoff then becomes cost effectiveness or retaining the money within the U.S. Congress chose the latter, and by so doing reduced the overall housing market competition in bidding overseas jobs.

5.7.3 Knowledge and Experience

The factory-built industry is not organized to work on government turn-key contracts. Very few companies can handle a contract that calls for site preparation, construction of units, and delivery of them. Joint ventures between site-built housing firms and factory-built companies will be created to share in these duties unless factory-built companies decide to gain expertise in these areas and be responsible for the whole project. If knowledge and experience are not adequately shared between the firms, then the construction process will be complicated. Before the government agreed to this type of construction, these firms competing in the housing market had no reason to be affiliated. Even this lack of experience with affiliation of the firms is a drawback for government projects. Decision makers must be made aware of this problem in order to understand any unexpected outcome on a particular project such as the one at Ft. Irwin.

The key to success for these contracts may well be the knowledge and experience of the contractor in these kinds of operations. One day experienced team organizations may be so numerous that this type of housing will be a successful alternative for the government.

5.7.4 Transportation

The distance that factory-built housing can be transported is limited. Especially for modular units, a radius of 300 miles from the plant is the farthest distance that the units can be shipped economically. When shipping across state lines, additional restrictions or limitations may be placed on a shipment. The individual states control highway regulations. Although uniformity and conformance among the states needs to occur, states are extremely unlikely to relinquish any jurisdiction or change any regulation in this area solely to meet the needs of military housing.

A stated advantage of factory-built homes is the short amount of development time for design. Designs are restricted to meet road and bridge widths. Highway widths and rail capacities limit the dimensions of three-dimensional units. Wide loads are costly, move more slowly, and require more manpower. Delivered material at sites for stick-built homes may have been damaged in shipment, but can be easily returned for replacement material. Damages in transporting factory-built units can be significant. Also, the units cannot be returned or replaced as easily as basic materials. Therefore, transportational restrictions and damaged goods cause problems for the factory-built agencies.

As mentioned before, overseas transportation of three-dimensional units is expensive. Therefore, shipment of panels for overseas use by local contractors and labor may prove more cost effective. This is true since for shipment overseas, costs are determined by volume and not weight.

5.7.5 Local Regulations and Ordinances

Local communities have passed zoning ordinances restricting the location of manufactured housing. These restrictions are a carryover from the early days when "trailer-coaches" were prohibited. Zoning regulations may not have changed as the manufactured industry advanced. The implication for the Navy is significant only when local land is purchased for placement of manufactured housing. The community resents, in their view, the lack of respect for their attitudes. It is true that the community has no voice in the Navy's action, but working relationships can be impaired as a result of such an action. As time passes and zoning changes, this problem will subside and eventually disappear.

Zoning restrictions are a manifestation of the image problem that lingers for the industry. Although exclusionary zoning of manufactured housing has been challenged and ruled unconstitutional in several states, changes in zoning have been slow to occur. Thus, the Navy's involvement in this community problem may be small.

Even though local jurisdiction may not apply to Navy Housing, confrontations with local and state authorities may have significant consequence. No better example than the Army's disagreement on jurisdiction with state authorities on the Ft. Irwin project can be given. Clarifying Navy regulations, though, can reduce problems of this nature.

5.7.6 Repercussions to Home Builders and Unions

Traditional home builders and their national organizations have not opposed factory-built housing since a threat of reduced available jobs has not occurred. Although this type of housing cuts into the traditional market competition, builders see this industry as just that -- competition.

Conventional home builders observe the cost differential as a difference in quality, but do realize that equal or better quality can be obtained at a higher cost. The builder associations rely on the fact that sufficient numbers of people have an image of a home and a factory-built home does not fulfill that image. Home builders are not vocal about manufacturers cutting into a portion of the market since they recognize that many buying a factory-built home could not afford the stick-built home anyway.

Predictions to home builder responses are difficult to make, but traditional home builders recognize the loss of previous ensured government contracts with its large jobs and profit. As more factory-built companies join in bidding and award of these contracts, the traditional builder will become uncomfortable. However, no changes will be made in areas where factory-built is given preference unless the stick-built can compete in the same categories. Barring any unforeseen changes, industrialized housing is here to stay and all must accept this.

Unions' attitude are becoming more positive and almost encouraging the rewards of this industry.

> Trade unions frequently oppose industrialization, seeing it as a method that eliminates traditional skilled jobs...The growth of the 'industrial union;, whose members are not divided up along traditional craft lines of plumber, bricklayer, etc., but who work in response to the needs of the factory, promises to placate fears about elimination of traditional craft jobs. More and more, labor leaders are recognizing that it is better to cooperate with this inevitable trend to industrialization than to risk being left out.[31]

Unions know that wages are lower in the plant and unskilled labor is at times prevalent, but the work is stable and survives difficult economic

conditions. For example, Cardinal Industries, one of the largest modular home builders, has not had an employee layoff in thirteen years. Because labor unions encourage positive results from factory-built housing, no union problems with these companies is anticipated on Navy contracts.

The Navy is studying and learning the benefits of factory-built housing. Evaluation of these projects over a period of years is extremely important in learning about cost effectiveness, the maintenance and repair and other costs, plus the good and bad effects this type of housing has on the Navy. Otherwise, without this effort, factory-built housing as an alternative cannot be judged.

CHAPTER 6
CONSTRUCTION, STANDARDS, AND COST OF FACTORY-BUILT HOUSING

6.1 Introduction

Factory-built housing involves several types of construction groups -- manufactured, modular, and panelized. The latter two groups follow very closely with the construction of site-built housing. Panels are often installed in a site-built home, and except for the use of the assembly line, modular construction resembles traditional construction and complies with most of the same codes. The major variation in construction, standards, appearance, and cost is for manufactured housing.

6.2 Manufactured Housing Construction

6.2.1 Basic Principle Design

The design for manufactured housing is perceived as a structural box. "A mobile home is designed and constructed as a completely integrated structure capable of sustaining its design load requirements and capable of transmitting these loads to stabilizing devices without causing an unsafe deformation or abnormal internal movement of the structure or its parts."[32] The regulations governing manufactured housing are more lenient in certain areas and more stringent in others when compared to site-built homes. The design as a structural box beam allows for more efficiency in weight and resistance to forces. The large cross-section is resistant to the twisting or lateral buckling caused during transportation. The box structure design permits the surfaces to act as a

structural load-bearing element as well as to provide enclosure. Thus, loads are distributed throughout the entire structure and so walls are thinner and members are smaller. Manufactured housing for Navy projects is transported from the factory to the final location. The home is, therefore, subjected to different loading conditions in-transit, during erection, and in its final position. Since in-transit supports such as the wheels and the hitch span greater distances than supports for a conventional home, the structure requires greater strength. On the other hand, when in its final position, supports are provided at least every 12 feet. The Navy places mobile homes on permanent foundations so the unit is subjected to high tensile stresses when lifted onto foundations. The manufactured home in its permament location must have been designed to withstand the weight of the home plus its contents and the live loads for the floor, the roof, the wind, and hurricane forces.

Wind loads are more significant for the mobile home than for a site-built home. These loads create vertical uplift forces. A manufactured home is built on an I-beam chassis which is off the ground; therefore, the standards are established to prevent these vertical forces from causing the structure to overturn or slide. "In the building codes for traditional housing, uplift force requirements are stipulated to prevent the shearing off of eaves, cornices, and other roof projections from the main structure."[33]

Manufactured units are lighter due to the size and thicknesses of elements and for transportation purposes. The lightweight construction is preferred for resistance to earthquakes, because the structure is more flexible and better able to handle shock waves. The chassis and the running gear absorb some of the horizontal stresses encountered in earthquakes.

6.2.2 Construction Methods and Components

The construction of manufactured housing can be broken down into four major areas: the chassis, floor system, wall system, and roof system. These are bonded together to act as a total structural unit. Two cambered I-beams run the length of the chassis and provide the major structural strength. Heavy-duty axles, leaf springs, and tires comprise the running gear of the chassis. Due to the concentrated load, the axles are reinforced by longitudinal beams with cantilevered outriggers making efficient use of the two main beams by providing additional floor area. The A-frame hitch is two tongue members with a coupling socket for towing.

The floor consists of 2 x 6 inch joists placed at 16, 20, or 24 inch centers depending upon the quality provided by the manufacturer. "Dadoed 1 x 4 cross-members spaced 48 inches on center provide cross-bracing for the floor joists and serve as nailers for the subfloor on top and the undersiding below."[34] Particle board or plywood, 5/8 inches thick, is secured over the joints. Rustproofed water and sewage lines, and metal heat ducts are installed under the flooring and insulated by 1½ inch fiberglass rolls with a polyethylene vapor barrier. The bottom of the floor is protected from moisture and rodents by a 3/8 inch asphalt insulation covering.

Partitions are assembled and positioned on the floor of the unit before being anchored in place. These walls transfer roof loads to the floor. Usually on the interior, plywood panels are attached to 2 x 4 wall studs spaced 16 inches on center with ½ inch plywood for sheathing. Some manufacturers use 2 x 3 studs in combination with ¼ inch sheathing

or place the wall studs on 20 or 24 inch centers. "Unlike the traditional home, where the sheathing is applied to the exterior, the sheathing in mobile homes is applied to the interior side of the walls and serves additionally as a finished wall surface."[35] Continuity between the walls and floor is needed so steel tie plates are glued, nailed, or bolted to the floor, or wall studs extend past the bottom plate to the floor. Insulation varies from 1 1/8 to 2 inch blanket types to 2 5/8 inch batt type. Aluminum siding is applied to the exterior.

Navy Housing stipulates that double-wides only will be used. Therefore, the roof constuction for these employs triangular trusses. The roof is slightly pitched with the truss 2 inches high at the ends gradually increasing to 6 to 8 inches. The subroof is a 3/8 inch rigid insulation board. Rubberized and fiber coating cover the roof decking, and galvanized steel or aluminum is used as an exterior roof. Roof insulation is either blown in or placed as batts.

The Navy requires Class A finish gypsum board on interior walls. The ceiling consists of fire-rated acoustical planks. Thermal, double-glazed windows plus plastic trim at joints and corners are required for Navy Contracts.

The Federal Manufactured Housing Construction and Safety Standards (FMHCSS) require that all units must bear a data plate showing the following: the name and address of the manufacturer, the serial and model number, date produced, statement of compliance with federal standards, list of major factory-installed equipment, a reference as to which structural zone (roof load zone) and wind zone the home was designed for and duplicates of maps showing these zones, and the name of the

agency which approved the design. For modular construction, a data plate similar to this is required for each section. The manufacturer is required to provide an acceptable system of anchorages with connections needed to transfer loads.

6.3 Structural Differences of Manufactured and Conventional Homes

Manufactured and conventional homes are extremely difficult to compare on a one-to-one basis because different principles are involved. The most significant differences are structural.

Three basic differences are:

1. Whereas main loads are carried by a stud-frame system in the conventional home, the mobile home uses a stressed-skin system.
2. The mobile home employs unibody construction.
3. The mobile home is dependent on the chassis to carry a portion of the floor loads.[36]

The stressed-skin system integrates the framed components to create a continuous skin. The structure then acts as a unit with most of the loads carried diagonally by the outer layers. Bonding between studs and walls is critical for forming an integral structure. Joints between the horizontal and vertical surfaces must be tight enough to transfer stresses, otherwise, high stress concentrations may cause separation. The number of openings including doors and windows should be a minimum to maintain this structural integrity in order to resist large shear deflections which may eventually cause panels to buckle.

The purpose of the design is to achieve unibody construction so the unit as a whole absorbs stresses. This again emphasizes the importance of structural continuity. Critical stress areas are at the bottom points

between the floor-chassis and wall-floor. The key concept in manufactured housing is for the entire unit to absorb stresses in these areas. Nevertheless, a conventional home is designed to transfer loads from one structural component to another.

Unlike the conventional home, the chassis carries most of the load, and of course, prevents floor sag. Conventional homes contain 2 x 8 inch floor joists which carry all loads independently. The manufactured home is able to use reduced floor joists with 2 x 6 inch members. In addition, manufactured housing must withstand dynamic impact stresses during transfer to site. During transit, vertical movements of the chassis members can cause cracks in the floor and break the floor seams. Areas over the axles, and between the axles and the hitch, must withstand the highest concentration of stresses. These engineering principles are not employed in designing a conventional home.

6.4 Construction and Contractual Changes of Factory-Built Housing

The Navy and contractors who are awarded contracts for factory-built units encounter differences in construction material, equipment, and contractual arrangements when compared to a conventional home. Conventional housing materials include brick and wood, but factory-built housing uses more aluminum, plastics, fiberglass, metal, and particle board. The Navy must check the adequacy of these materials. General contractors who build conventional homes are exposed to different construction techniques and equipment. For factory-built housing, units are lifted for placement on a foundation. Contractors may not be experienced in lifting a unit by cables in the roof structure. A traditional home contractor may never have used a crane for any construction process.

This, though, is required on factory-built housing. Large units require specialized equipment such as larger cranes or uncommon transportation conveyances such as barges in order to complete the contract. Joint ventures will probably be employed to perform Navy Housing contracts. Responsibility for building units and site preparation will be divided between the contractors. Workers building factory-built units benefit from the methods of construction. In the factory, workers do not have many uncomfortable positions or obstructed accesses. Especially for modules, ceiling panels are tilted vertically for painting, and the roof is constructed at floor level before being lifted onto the structure. With contracts for factory-built housing, the Navy will be exposed to construction techniques and contract arrangements not normally used on conventional housing acquisition.

6.5 Navy Standards

The FMHCSS is the national standard for manufactured housing, and states are prohibited from adding any special requirements. However, prior to the commencement of construction, the Navy requires that the manufacturer obtain approval from the Design Approval Primary Inspection Agency (DAPIA). Manufacturers are a part of a two agency system for design approval and inspection. The other agency is the Primary Inspection Agency (PIA). Both agencies ensure compliance with federal standards.

For factory-built housing, the following codes are applicable for Navy projects:

1. HUD Minimum Property Standards 4900.1 (single family and duplex units) and 4910.1 (multiple unit buildings).

2. HUD Manual of Acceptable Practices 4930.1.
3. HUD Minimum Design Standards for Community Water Supply Systems 4940.2.
4. HUD Minimum Design Standards for Community Sewage Systems 4940.3.
5. National Electrical Code.
6. Uniform Building Code.
7. Uniform Plumbing Code.
8. National Fire Protection Association Life Safety Code.
9. HUD Intermediate Minimum Property Standards Supplement 4903.2.[37]

The State of California criteria for factory-built housing is being considered for incorporation into the Navy criteria. The California criteria includes:

1. Uniform Building Code.
2. Uniform Building Code Standards.
3. Uniform Plumbing Code.
4. Uniform Mechanical Code.
5. National Electric Code.
6. Acceptance Criteria for Sandwich Panels by the International Conference of Building Officials (ICBO).
7. Acceptance Criteria for Sandwich Panel Adhesives by ICBO.
8. Energy Conservation Standards for New Residential Buildings (California Administrative Code, Title 24).[38]

6.6 Cost

Upon completion of the analyses by the Navy on the NAS Fallon project and by the Army on the Ft. Irwin project, information on repair and maintenance costs, energy efficiency, and product durability will be

available. Currently, very little information on costs for factory-built housing exists because these manufacturers have not been awarded contracts for housing, other than these two projects, within the continental United States. Outside the continent, the Adak project is the latest project using factory-built housing. In addition, Navy requirements for manufactured housing have varied significantly from the standard product.

6.6.1 NAS Fallon

The government estimate and the final project costs for the NAS Fallon housing project is included as Table 1. The total final cost of only the 70 mobile homes is $2,625,476 which averages to $37,507 per unit. The initial report on repairs and maintenance of these units will be submitted to NAVFAC in March, 1985.

6.6.2 Other Projects

The modular units for the 1978 housing project at Adak, Alaska cost $95,000 per unit. The transportation costs on this project were close to 40 percent of the cost of the entire project.

The 254 conventional units at Ft. Irwin were awarded for $12,574,000 at an average cost of $49,504 whereas the 200 factory-built units were awarded for $9,110,000 at an average cost of $45,550. Since the FY 1983 legislation requiring changes to the RFP language allowing for factory-built housing, only four proposals for manufactured housing have been submitted. No project was awarded to these firms so no furter cost data is available on manufactured housing.

GOVERNMENT ESTIMATE

66 Mobile Homes (base bid)	$2,494.388
4 Mobile Homes (additive item)	131,088
Government Furnished Equipment	38,000
Electrical connection charges (Sierra Pacific)	72,000
Utilities connection construction contract	79,150
Contingency (2%)	56,293
Supervision inspection and overhead (3.5%)	100,482
Design	120,000
	$3,091,401

Authorization (The $530,000 for Solar construction was unavailable due to changes in economic analysis criteria which rendered the use of active solar systems non-cost effective at Fallon. All solar related construction was deleted).	$2,820,000
110% of authorization	$3,102,000

FINAL PROJECT COSTS

70 Mobile Homes (award)	$2,625,476
4 change-orders	5,866
Government Furnished Equipment	36,890
Electrical connection charges (Sierra Pacific)	82,589
Utilities connection construction contract	77,150
Supervision inspection and overhead (3.5%)	98,979
Design Costs	135,650
	$3,062,600

TABLE 1. FY 1979 FAMILY HOUSING PROJECT
NAVAL AIR STATION, FALLON, NEVADA

CHAPTER 7
CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

7.1.1 Quality and Competitive Price Needed

According to a consensus of industry personnel, factory-built housing does not cost less than conventional housing, but better quality for the same price is obtained. The cost data on the current projects is not clear cut on this fact, but personnel familiar with the industry believe a higher quality product is acquired at the same price. Nevertheless, a definite difference exists between the quality supplied by manufactured housing firms and the rest of the factory-built industry. Manufactured housing projects have not been able to compete in quality points on turnkey proposals because the manufacturers are not willing to provide a non-standard product at a price for which they can still be competitive. Therefore, rather than altering the design to increase the chance of award, manufacturers are hoping to supply a lower competitive price. Due to the emphasis on specific quality features in turnkey acquisition, manufacturers will have to alter certain quality features in order for proposals to become competitive for award without significantly increasing price. On Navy projects to date, an appropriate quality product at the same price has not been demonstrated. Possibly then, this is only true for a small segment of the factory-built industry.

7.1.2 Use of a New Construction Team

The theory behind the legislation allowing for factory-built housing is that the military can obtain an adequate item at lower cost. Congress was convinced by the officials that this could be accomplished. Nevertheless, these officials were unable to foresee that the Navy's acquisition method would require that eventually manufacturers and general contractors join forces to perform housing turnkey contracts. These manufacturers usually sell their product "at their door." Dealers assist in transportation and customer site installation, but the manufacturers do not want to get involved in these areas. Generally, the breadth of knowledge and expertise to make an entire project successful does not exist within the manufactured housing industry. Manufacturers rarely undertake projects requiring site work or planning, and general contractors are not familiar with manufactured construction and transportation requirements. Coordination and cooperation between contractors are needed for successful results.

7.1.3 Forfeiture of Cost Effectiveness Overseas

Interest in housing projects varies depending on location. For overseas projects where factory-built housing is required by law, interest appears to be high. However, contractors may be afforded a better opportunity at larger profits since a majority of the costs on overseas projects is transportation. These projects cannot be cost effective because of these transportation costs. Unless use of panels requiring more labor is allowed, the military will pay the cost of shipping dead space on these types of projects. Overseas shipment is based on volume and not weight so any three dimensional shipment will consist of some dead space as a part of the volume calculation. The only advantage foreseen from these

projects is the experience gained in employing this type of construction for purposes of military mobilization. It may be worthwhile for this knowledge to be kept current for this reason.

7.1.4 Manufacturer's Loss of Market

On projects within the continental United States, manufacturers have more difficulty competing on Navy Housing projects. In fact, they may not be interested, because if they are awarded a contract, standards will require that they gear up differently. Although manufacturers produce a number of units over a period of time, most of them are only small businesses with a single production line. Thus, these manufacturers are not capable of large special orders unless they are willing to sacrifice their normal market. By making any necessary changes to the production line, manufacturers can lose their market. As long as the manufactured housing industry is able to provide affordable housing to the general public and economic conditions are good, there is no reason for manufacturers to take on a short-lived demand for military housing and jeopardize any part of their market that does not require changes in procedures or standards. If, however, manufacturers see government contracts as a substantial, serious market, then this attitude may change. Overall, Congress, through legislation, may have brought more competition to contracts for military housing in the United States, but on overseas projects, cost effectiveness has been forfeited in favor of an international balance of payments issue.

7.2 Recommendations

7.2.1 Discourage Prejudices

Although conclusions about the negative effect factory-built housing has on cost effectiveness have been made, all branches of the military should not be prejudiced about the use of this alternative until all evaluations are complete. Regulations should exist and minimums be set whereby a factory-built housing firm competing for a contract will be acknowledged as providing an equivalent product to the military sector.

Furthermore, occupants should not be encouraged to develop any bias about Navy Housing units which have been manufactured. With many factory-built housing types, a person is unable to distinguish it from a conventional home because appearances are very similar. A sign stating that the units are anything other than stick-built can create a negative image and subsequently a negative attitude about housing. Even word of mouth comments can undermine the success of a project by developing a negative image of the housing resources.

7.2.2 Survey Consumer Acceptance

While information on construction, cost, maintenance, repair, and energy is collected, one important item is being overlooked. If consumer acceptance of factory-built housing is important for morale, then occupants should be surveyed before they move in and as they leave so entry-exit comparisons can be made. With this information, a utility/cost matrix of cost effectiveness can be prepared with all the variables such as maintenance, repair, initial cost, construction, energy, and consumer acceptance considered.

7.2.3 Standardize Regulations

To encourage this industry when supplying units, uniformity is needed in the highway regulation of the states. Since each state has regulations on length, width, height, and weight, factory-built housing's interstate commerce is reduced. This lack of uniformity reduces competition from firms that would be willing to compete if it were not for some other state's regulation which they feel is excessive. The chances of a unifed system ever occurring are very minimal. This regulation capability is a state's right and one which would not be relinguished easily.

Moreover, the Navy must secure final clarifiaction of jurisdiction. Incorporation of state regulations into Navy standards or a judgement by a higher authority on jurisdiction with regards to controversies between state requirements and a lack of compliance by the Navy can result in expensive change orders being avoided. The cost or time involved in resolving this dispute could cost the government less than one change order on a large contract where the Navy was required to comply with a state regulation which had been omitted. Two options are available to resolve the dispute. State regulations could be incorporated into the Navy standards, or a set of federal regulations specifying DOD standards could be created.

7.2.4 Evaluate Claims of Higher Quality

The industry has the belief that for factory-built housing, a higher quality product at the same price is achieved. Nevertheless, when a quality review on turnkey proposals for Navy projects has been performed, the manufactured units were at the low end of the quality point scale, and thus, were not recommended for award. If higher quality at the same

price actually occurs, then the Navy should be eager to award contracts to factory-built manufacturers. Industry personnel with this belief should be requested to substantiate this claim. Also, the reviews by the quality evaluation teams should be analyzed in order to determine why this disparity exists.

7.2.5 Induce Competition

Since industry takes the chance of losing their market, DOD should check the differences between their requirements and what the manufacturers provide to see if the manufacturer's standard product could be more acceptable. Some flexibility may be allowed in the requirements depending upon the importance of a particular standard. Furthermore, for those areas where differences occur and flexibility is not possible, inducements might be needed to get this industry to compete for DOD projects and to make them not feel as though their market in the private sector has been lost. Apparently because Congress has forced the issue of factory-built housing, DOD has not been motivated to maintain a dialogue with this industry. Steps should be taken to test whether inducements for competition will make this alternative more successful.

7.2.6 Examine Contracts Carefully

As with any contract, plans and specifications for factory-built housing should be reviewed, but the factory-built housing is used, careful examination is especially important. A project using this type of housing has the greatest chance of a problem arising when units are attached together to form a structure. Points of connection should be shown on drawings and the method of connecting them should be clearly

specified. This is a lesson learned from a previous contract. Checking for this type of omission, can save time for the government and money for the contractor.

7.2.7 Update Publications

With the changes in policy required by legislation, publications describing the acquisition process should be updated. This is especially true for the Navy Housing Manual, NAVFAC P-930. Also in this manual, references to the United States, Puerto Rico, and Guam should be correctly referred to as the fifty states, Puerto Rico, and Guam since these areas are territories of the United States.

7.2.8 For Further Study

Two areas are possibilities for further study. First, an analysis of the differences in DOD regulations and industry standards is needed. Recommendations for any needed changes or loosening of DOD regulations, and suggestions of possible inducements for more competition from factory-built industries would be of great benefit. Second, since data on life cycle costs and management aspects of factory-built housing for the military is being collected for Congress over the next five years, a more detailed report of these aspects should be prepared at that time.

GLOSSARY

BAQ - Basic Allowance for Quarters

CNO - Chief of Naval Operations

DAPIA - Design Approval Primary Inspection Agency

EFD - Engineering Field Division

FH,N - Family Housing, Navy previously FHMA - Family Housing Management Account

FMHCSS - Federal Manufactured Housing Construction and Safety Standards

FY - Fiscal Year

HCD - Department of Housing and Community Development, State of California

HUD - Department of Housing and Urban Development

IBOP - International Balance of Payments

ICBO - International Conference of Building Officials

MAHC - Maximum Allowable Housing Cost

NMPC - Naval Military Personnel Command

NAS - Naval Air Station

NAVCOMPT - Office of Navy Comptroller

NAVFACENGCOM or NAVFAC - Naval Facilities Engineering Command

OPNAV - Operations Naval or Naval Operations

OSD - Office of Secretary of Defense

PCS - Permanent Change of Station

PIA - Primary Inspection Agency

RFP - Request for Proposal

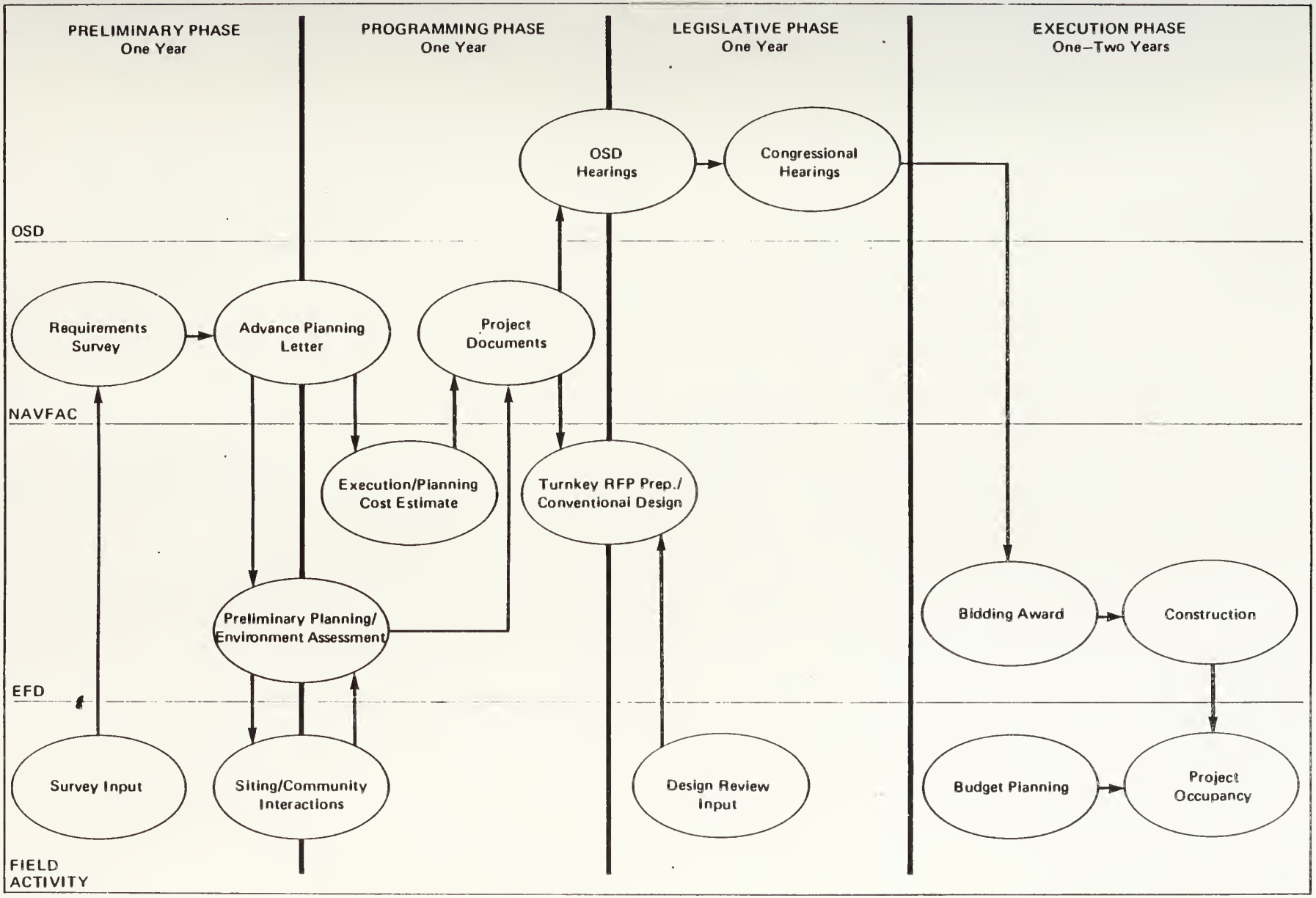
SEI - Site Engineering Investigation

SIOH - Supervision, Inspection, and Overhead

VHA - Variable Housing Allowance

WESTDIVNAVFACENGCOM or WESTDIV - Western Division, Naval Facilities Engineering Command

APPENDIX A



FAMILY HOUSING ACQUISITION PROCESS

Source: Ref. 3.

APPENDIX B

TABULATION OF FAMILY HOUSING SURVEY

REPORT CONTROL SYMBOL

			OFFICERS a	ELIGIBLE ENLISTED b	CIVILIANS c	SUBTOTAL (a + b + c) d	OTHER ENLISTED e	TOTAL (d + e) f
	1	DATE OF SURVEY						
REQUIREMENTS	2	TOTAL PERSONNEL STRENGTH						
	3	PERMANENT PARTY HOUSING STRENGTH AND KEY CIVILIANS						
	4	NUMBER OF FAMILIES						
	5	HOUSING REQUIREMENTS FACTOR						
NOT LIVING WITH FAMILY IN AREA	6	NOT LIVING WITH FAMILY (TOTAL: 7 + 10)						
	7	INVOLUNTARILY SEPARATED FAMILIES						
	8	(PREFER MILITARY QUARTERS)	( )	( )	( )	( )	( )	( )
	9	(PREFER PRIVATE HOUSING)	( )	( )	( )	( )	( )	( )
	10	VOLUNTARILY SEPARATED FAMILIES						
SUMMARY OF OCCUPIED HOUSING BY TYPE AND PREFERENCE — LIVING WITH FAMILY IN AREA	11	LIVING WITH FAMILY IN AREA (TOTAL: 12 + 19)						
	12	SUITABLY HOUSED (SUBTOTAL: 13 + 16)						
	13	IN MILITARY CONTROLLED HOUSING						
	14	(PREFER RENTING OFF POST)	( )	( )	( )	( )	( )	( )
	15	(PREFER OWNING OFF POST)	( )	( )	( )	( )	( )	( )
	16	IN PRIVATE HOUSING						
	17	(PREFER MILITARY QUARTERS)	( )	( )	( )	( )	( )	( )
	18	(PREFER RENTING OFF POST)	( )	( )	( )	( )	( )	( )
	19	UNSUITABLY HOUSED (SUBTOTAL: 20 + 23)						
	20	IN MILITARY CONTROLLED HOUSING						
	21	(PREFER RENTING OFF POST)	( )	( )	( )	( )	( )	( )
	22	(PREFER OWNING OFF POST)	( )	( )	( )	( )	( )	( )
	23	IN PRIVATE HOUSING (SUBTOTAL: 24 + 28)						
	24	(PREFER MILITARY QUARTERS)	( )	( )	( )	( )	( )	( )
	25	(PREFER RENTING OFF POST)	( )	( )	( )	( )	( )	( )
	26	EXCESS DISTANCE						
	27	SUBSTANDARD						
	28	EXCESS COST ONLY (Over MAMC)						
	29	LESS THAN $5						
	30	$5 TO $10						
	31	$10 TO $25						
	32	$25 TO $50						
	33	$50 AND MORE						
HOUSING OCCUPIED IN AREA — OWNED	34	IN OWNER OCCUPIED HOUSES (TOTAL: 35 + 36)						
	35	SUITABLE IN ALL RESPECTS						
	36	UNSUITABLE (SUBTOTAL 37 - 39)						
	37	EXCESS DISTANCE						
	38	SUBSTANDARD						
	39	EXCESS COST ONLY						
	40	IN OWNER OCCUPIED TRAILERS (TOTAL 41 + 42)						
	41	SUITABLE IN ALL RESPECTS (ON POST)	( )	( )	( )	( )	( )	( )
	42	UNSUITABLE (SUBTOTAL 43 + 44) (ON POST)	( )	( )	( )	( )	( )	( )
	43	EXCESS DISTANCE						
	44	SUBSTANDARD (ON POST)	( )	( )	( )	( )	( )	( )
	45	EXCESS COST ONLY (ON POST)	( )	( )	( )	( )	( )	( )
HOUSING OCCUPIED IN AREA — RENTED	46	IN RENTED HOUSING OFF POST (TOTAL: 47 + 48)						
	47	SUITABLE IN ALL RESPECTS						
	48	UNSUITABLE (SUBTOTAL: 49 + 51)						
	49	EXCESS DISTANCE						
	50	SUBSTANDARD						
	51	EXCESS COST ONLY						
HOUSING OCCUPIED IN AREA — MILITARY	52	IN MILITARY CONTROLLED HOUSING (TOTAL: 53 + 57)						
	53	ADEQUATE AS PUBLIC QUARTERS (VACANT)	( )	( )	( )	( )	( )	( )
	54	MILITARY OWNED (VACANT)	( )	( )	( )	( )	( )	( )
	55	MILITARY LEASED (VACANT)	( )	( )	( )	( )	( )	( )
	56	MILITARY SPONSORED (VACANT)	( )	( )	( )	( )	( )	( )
	57	INADEQUATE AS PUBLIC QUARTERS (VACANT)	( )	( )	( )	( )	( )	( )
	58	VACANT HOUSING (TOTAL: 59 - 61)						
	59	PRIVATE RENTAL HOUSING						
	60	FHA AND VA HELD RENTAL HOUSING						
	61	MILITARY HOUSING ADEQUATE AS PUBLIC QUARTERS						
	62	NUMBER OF UNSUITABLE UNITS INSPECTED						
	63	NUMBER OF INSPECTED UNITS RECLASSIFIED						
	64	ADJUSTMENT FACTORS						
	65	NAME AND LOCATION OF INSTALLATION:						

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Tabulation of Family Housing Survey (Sample)

TABULATION OF FAMILY HOUSING SURVEY

QUALITATIVE ANALYSIS OF REQUIREMENTS AND ASSETS

		EFFECTIVE REQUIREMENTS		SUITABLE HOUSING			DEFICIT
		NUMBER a	PERCENT b	MIL CONTROL c	OFF POST d	TOTAL (c + d) e	(a - e) f
66	O 10 THROUGH O 5		%				
67	1 OR 2 BEDROOMS		%				
68	3 BEDROOMS		%				
69	4 OR MORE BEDROOMS		%				
70	O 5 AND O 4		%				
71	1 OR 2 BEDROOMS		%				
72	3 BEDROOMS		%				
73	4 OR MORE BEDROOMS		%				
74	O 3 THROUGH O - 1 AND W - 4 THROUGH W - 1		%				
75	1 OR 2 BEDROOMS		%				
76	3 BEDROOMS		%				
77	4 OR MORE BEDROOMS		%				
78	ALL OFFICER GRADES (TOTAL 66 + 70 + 74)		%				
79	1 OR 2 BEDROOMS		%				
80	3 BEDROOMS		%				
81	4 OR MORE BEDROOMS		%				
82	E 9 THROUGH E - 7		%				
83	1 OR 2 BEDROOMS		%				
84	3 BEDROOMS		%				
85	4 OR MORE BEDROOMS		%				
86	E 6 THROUGH E 4 (Eligible)		%				
87	1 OR 2 BEDROOMS		%				
88	3 BEDROOMS		%				
89	4 OR MORE BEDROOMS		%				
90	ALL ELIGIBLE ENLISTED (TOTAL 82 + 86)		%				
91	1 OR 2 BEDROOMS		%				
92	3 BEDROOMS		%				
93	4 OR MORE BEDROOMS		%				
94	ALL ELIGIBLE MILITARY (TOTAL 78 + 90)		%				
95	1 OR 2 BEDROOMS		%				
96	3 BEDROOMS		%				
97	4 OR MORE BEDROOMS		%				
98	KEY CIVILIANS - O EQUIVALENT		%				
99	1 OR 2 BEDROOMS		%				
100	3 BEDROOMS		%				
101	4 OR MORE BEDROOMS		%				
102	KEY CIVILIANS - E EQUIVALENT		%				
103	1 OR 2 BEDROOMS		%				
104	3 BEDROOMS		%				
105	4 OR MORE BEDROOMS		%				
106	ALL ELIGIBLE CATEGORIES (TOTAL 94 + 98 + 102)		100.0%				
107	1 OR 2 BEDROOMS		%				
108	3 BEDROOMS		%				
109	4 OR MORE BEDROOMS		%				
110	E 4 (Ineligible) - THROUGH E-1		100.0%				
111	1 OR 2 BEDROOMS		%				
112	3 BEDROOMS		%				
113	4 OR MORE BEDROOMS		%				

114 REMARKS

115 AUTHENTICATION	NAME AND TITLE (Typed or Stamped)	SIGNATURE	DATE

116 NAME AND LOCATION OF INSTALLATION

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Page 2 of 2 Pages

Tabulation of Family Housing Survey (Sample)

APPENDIX C

CUT ON THIS LINE, IF NECESSARY

NARRATIVE ON FAMILY HOUSING	REPORT CONTROL SYMBOL

1. MISSION

2. LOCATION

3. COMMUNITY SUPPORT

4. HOUSING ON POST

5. JUSTIFICATION OF PROPOSED HOUSING

6. AUTHENTICATION	NAME AND TITLE (Typed or Stamped)	SIGNATURE	DATE

7. NAME AND LOCATION OF INSTALLATION:

DD FORM 1 MAY 64 1379 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

Narrative on Family Housing (Sample)

APPENDIX D

1 COMPONENT	FY 19____ MILITARY CONSTRUCTION PROGRAM	2. DATE
3 INSTALLATION AND LOCATION	4 COMMAND	5 AREA CONSTR COST INDEX

6 PERSONNEL STRENGTH	PERMANENT			STUDENTS			SUPPORTED			TOTAL
	OFFICER	ENLISTED	CIVILIAN	OFFICER	ENLISTED	CIVILIAN	OFFICER	ENLISTED	CIVILIAN	
a AS OF										
b END FY 19										

7. INVENTORY DATA ($000)

a. TOTAL ACREAGE . . . . . .
b INVENTORY TOTAL AS OF . . . . . .
c. AUTHORIZATION NOT YET IN INVENTORY . . . . . .
d. AUTHORIZATION REQUESTED IN THIS PROGRAM . . . . . .
e. AUTHORIZATION INCLUDED IN FOLLOWING PROGRAM . . . . . .
f. PLANNED IN NEXT THREE PROGRAM YEARS . . . . . .
g. REMAINING DEFICIENCY . . . . . .
h. GRAND TOTAL . . . . . .

8. PROJECTS REQUESTED IN THIS PROGRAM:

CATEGORY CODE	PROJECT TITLE	SCOPE	COST $000	DESIGN STATUS START	DESIGN STATUS COMPLETE

DD FORM 1 DEC 76 1390
S/N 0102-LF-001-3901

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FY 19--Military Construction Program (Sample)

APPENDIX E

1 COMPONENT	FY 19__ MILITARY CONSTRUCTION PROJECT DATA	2 DATE

3. INSTALLATION AND LOCATION	4 PROJECT TITLE

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8. PROJECT COST ($000)

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)

10 DESCRIPTION OF PROPOSED CONSTRUCTION

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Military Construction Project Data (Sample)

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